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FOREST RESOURCES OF THE NORTHERN COASTAL PLAIN OF SOUTH CAROLINA

A Progress Report

By

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Appalachian Forest Experiment Station
R. E. McArdle, Director
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INDEXED

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To meet the demand for Forest Survey information, this progress report on the "Forest Resources of the Northern Coastal Plain of South Carolina" is issued in advance of the final report for the State.

Acknowledgment is made to the Forest Survey staff of the Southern Forest Experiment Station for assistance in assembling the data for this release; and to the Regional Forester, Southern Region, U. S. Forest Service, and Mr. H. A. Smith, State Forester of South Carolina, for review of the manuscript.

Additional copies of this report and copies of forthcoming releases may be obtained by writing to the Director, Appalachian Forest Experiment Station, Asheville, N. C.

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PREFACE

Through the McSweeny-McNary Forest Research Act, of 1928, Congress authorized the Secretary of Agriculture to conduct a comprehensive survey of the forest resources of the United States. The Forest Survey was organized by the research branch of the U. S. Forest Service to carry out the provisions of the act, and each regional Experiment Station is responsible for this work in its territory. In the Middle Atlantic States the Forest Survey is an activity of the Appalachian Forest Experiment Station with headquarters in Asheville, North Carolina.

The work of the Forest Survey is divided into five major phases:

1. Inventory. Determination of the extent, location, and condition of forest lands, and the quantity, species, and quality of the timber on these lands.

2. Growth. Determination of the current rate of timber growth.

3. Drain. Determination of the drain caused by industrial and domestic wood use, and the total loss from fire, insects, disease, suppression, and other causes.

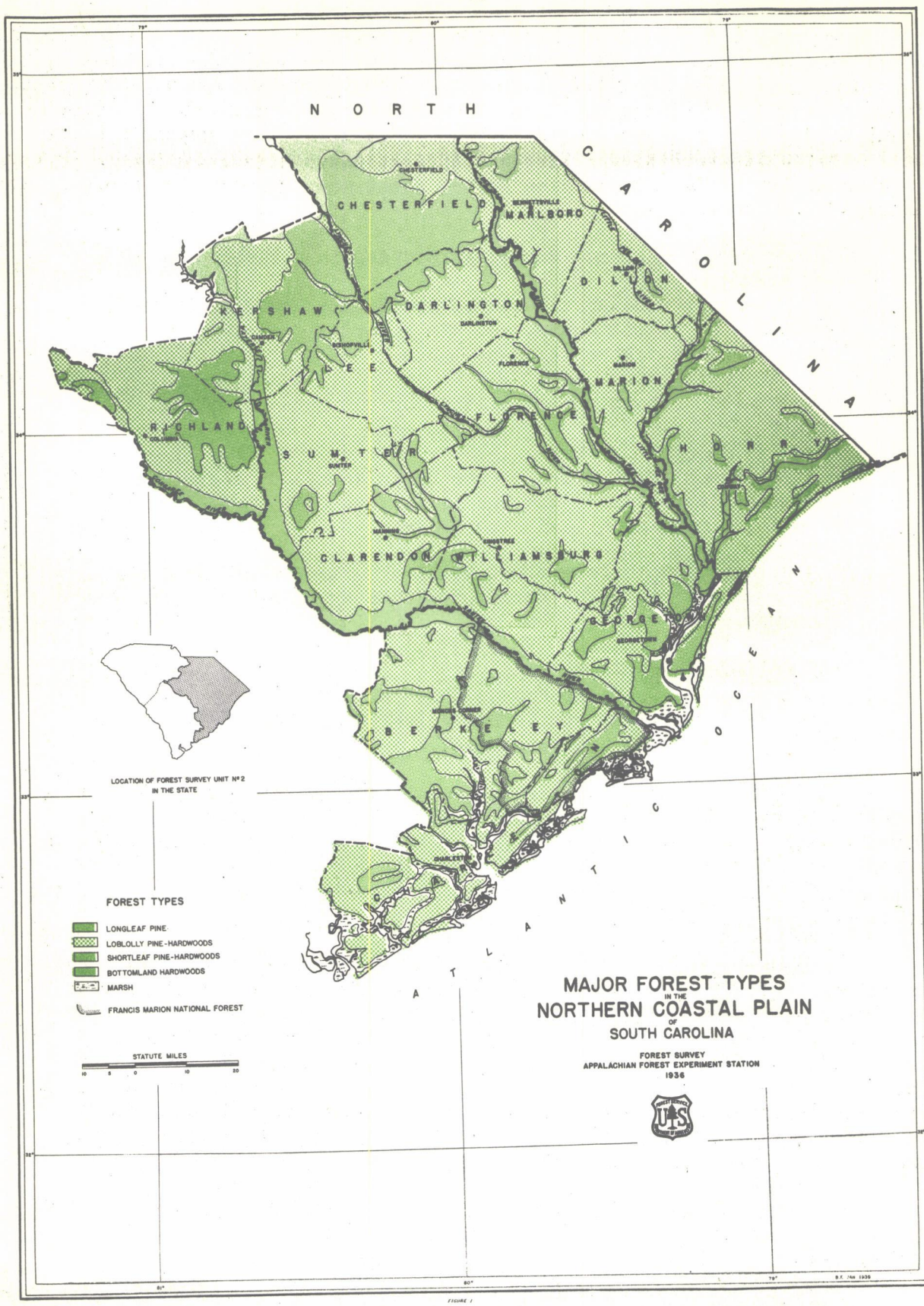
4. Requirements. Determination of the current and probable future requirements for forest products by all classes of consumers.

5. Policies and plans. Analysis of the relation of these findings to one another and to other economic factors as a basis in formulating public and private policies and plans of forest land use and management.

This progress report presents preliminary information on the first three of these phases for the Northern Coastal Plain of South Carolina, (Forest Survey unit No. 2) one of the three units into which the state was divided. Similar releases are being prepared for the other units, the Southern Coastal Plain and the Piedmont Region. A complete report for the state will be published at a later date.

Information on the forest resources was obtained by a field survey in the fall of 1936. A total of 9,429 sample plots were established at intervals of one-eighth of a mile on compass lines 10 miles apart, extending across the Unit from the southwest to the northeast. The statistical sample obtained from these plot records forms the basis for all area, volume and growth estimates in this report, except where other sources are directly credited. Owing to the statistical nature of the data, small tabular items have the greater probability of error and should be considered as indicating relative magnitude rather than actual values.

The figures on consumption of forest products for industrial and domestic purposes were obtained by canvassing primary wood-using industries and by sampling representative domestic consumers.


NORTH
CAROLINA
CHESTERFIELD
MARLBORO
DILLON
DARLINGTON
KERSHAW
LEE
FLORENCE
MARION
HORRY
RICHLAND
SUMTER
CLARENDON
WILLIAMSBURG
GEORGETOWN
BERKELEY
CHARLESTON
ATLANTIC OCEAN
LOCATION OF FOREST SURVEY UNIT N° 2 IN THE STATE
FOREST TYPES
LONGLEAF PINE
LOBLOLLY PINE-HARDWOODS
SHORTLEAF PINE-HARDWOODS
BOTTOMLAND HARDWOODS
MARSH
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STATUTE MILES
10 5 0 10 20
MAJOR FOREST TYPES
IN THE
NORTHERN COASTAL PLAIN
OF
SOUTH CAROLINA
FOREST SURVEY
APPALACHIAN FOREST EXPERIMENT STATION
1936

Figure 1

FOREST RESOURCES OF THE NORTHERN COASTAL PLAIN OF SOUTH CAROLINA

General Description of the Unit

The area discussed in this report is formed by a group of 16 counties in the northeast section of the state (fig. 1). Extending from the sand hills of Richland, Kershaw, and Chesterfield Counties eastward to the ocean the unit includes approximately 7½ million acres, 60 percent of which is forested. One of three units established by the Forest Survey in the state, it is sufficiently homogeneous in its physical and economic characteristics to warrant a separate study of its forest resources.

The topography is that common to the Atlantic and Gulf Coastal Plains. Saltwater marshes, intersected by broad rivers and tidal sounds characterize much of the coast line. These treeless marshes gradually merge into the sandy, pine flatwoods and the broad, hardwood swamps bordering the rivers. Elevation in the coastal area seldom exceeds 50 feet above sea level, and the general land surface shows little relief. Farther inland these conditions gradually change as the successively higher terraces are reached. Here the more pronounced slopes, higher interstream altitudes, and narrower stream valleys give a distinctly rolling character to the land surface. Near the western boundary a narrow, irregular belt of sand hills extends across the entire unit through Chesterfield, Kershaw, and Richland Counties. This is a distinct topographic zone lying between the Coastal Plain and the higher Piedmont Plateau which intrudes into the western border counties of the unit. From elevations of approximately 600 feet in the Piedmont areas the general land surface drops sharply along the eastern edge of the sand hills and thence with a more gradual descent to the flatwoods and marshes along the coast.

Drainage is southeasterly through the Santee and Pee Dee Rivers and their tributaries. With headwaters in the upper Piedmont west of this unit these rivers traverse the sand hills through well-defined valleys. Through the rolling uplands of the Coastal Plain the valleys widen and the stream velocity drops markedly until, near the coast, the main channels divide into many sluggish branches and meander through broad, wooded bottomlands and tidal marshes. The larger rivers are heavily burdened with silt washed from the fields and caving banks in the headwaters above the sand hills, whereas the Ashely, Black, and a few smaller streams rising in the Coastal Plain seldom have heavy silt content.

Throughout the unit most of the soils are sedimentary clays and sands moderately well-drained except in the flatwoods and bottomlands where insufficient gradient and periodic inundation cause surface water to accumulate during the winter and spring months. In the sand hills the deep, coarse-textured soil retains little moisture and is so deficient in many plant nutrients that little opportunity is offered for either profitable farming or commercial timber production.

Although moderate sheet erosion and occasional gullying occur on the abandoned fields and steeper slopes of the upper Coastal Plain, the erosion problem in general is comparatively unimportant over most of this unit.

Transportation and travel facilities are adequate for the needs of the area. The Seaboard Air Line, the Southern, and the Atlantic Coast Line railroads with their subsidiary lines provide rail service for every county seat in the unit. Many inter-connecting carriers, especially in the central agricultural counties, serve all the important manufacturing and producing centers. Only in the heavily timbered portions of the coast counties are there any extensive areas more than 6 miles from railroads. A network of hard-surfaced highways is spread over the entire unit; local farm-to-market and county highways give year-round access to practically all areas.

The Intracoastal Waterway and the navigable channels of the Santee and Pee Dee Rivers with their larger tributaries provide facilities for water transportation. For shallow draft barges and small power boats the natural channels of the Congaree and Wateree are usable as far as Columbia and Camden, respectively. The Santee-Cooper River hydroelectric project being constructed near Moncks Corner will divert water from the Santee to the Cooper River, providing an improved navigable waterway between Charleston and Columbia. The Pee Dee River, now under Federal improvement, has a navigable depth of 9 feet to Smith's Mills in northern Georgetown County. The Waccamaw River is open to shallow draft vessels from the mouth of Winyah Bay to Red Bluff in Horry County. Comparatively little use has been made of these waterways in recent years, although barging of pulpwood and other forest products has increased since the construction of new pulp mills at Georgetown and Charleston.

Charleston is a deep water port with terminal facilities for coastwise and transatlantic shipping. Forest products handled at this port during 1936 totaled nearly 300,000 tons. Georgetown, located on an estuary of Winyah Bay, is connected with Charleston through the intracoastal canal and handles considerable tonnage in forest products, particularly pulpwood, in both coastwise and internal shipments.

The Census of 1930 recorded a population of 660,461 for this area, 53 percent of which was negro. In only 5 of the 16 counties were there more white than negro inhabitants. Charleston, with a population of 62,265, and Columbia, the State capital, population 51,581, are the largest cities in the unit and also in the state. Their influence as marketing, banking, and railroad centers is felt throughout the entire area. These cities, together with Sumter, Florence, and a number of smaller industrial and trading centers contain most of the urban population. The rural population, however, predominates in the area as a whole and accounts for 72 percent of the total. During the decade 1920-30 the Census records a 3 percent increase in total inhabitants notably in Florence, Horry, and Marion Counties. Six counties sustained losses, the largest of which was 14 percent in Clarendon County.

Agriculture is the leading activity in the area. The Census of 1935 listed nearly 60,000 farms and an agrarian population of 370,923, about 56 percent of the total for the unit. In 1936 the Survey found a total of nearly 2½ million acres in cropland and improved pasture located largely in the central counties (table 1).

In Kershaw, Lee, and Florence Counties, according to the 1935 Census of Agriculture, approximately 80 percent of the land area is in farms, including woodlands, while in Charleston, Berkeley, and Georgetown Counties

only 20 to 32 percent is in farm ownership. The average farm is about 68 acres, of which 35 acres are woodland. Approximately 61 percent of the farms were leased to tenant operators, over one-third of whom were share-croppers.

Table 1. - Total land area classified by major use

Land use class	Area		Proportion of total area
	Acres		Percent
Forest			
Productive	4,498,400	59.5	
Non-productive	9,600	0.1	
Total forest	4,508,000		59.6
Non-forest			
Agricultural			
Cropland	2,329,400	30.8	
Improved pasture	68,200	0.9	
Abandoned cropland	124,400	1.6	
Marsh	321,000	4.3	
Towns, rights-of-way, etc.	215,100	2.8	
Total non-forest	3,058,100		40.4
Total	7,566,100		100.0

Half of all gainful workers in the unit were employed on farms, according to the 1930 Census. The Unemployment Census[1/] taken in November, 1937 indicates that of all unemployed, partially employed or relief workers in the area, 40 percent were farm residents.

In this, as in many other sections of the South, much of the forest acreage is held in small tracts and wood-lots seldom exceeding 500 acres in extent. According to the 1935 Agricultural Census more than 1½ million acres or about one-third of the total forest area is farm woodland. The larger ownerships are confined principally to the coastal counties where extensive agricultural development has not taken place. Large estates and the remnants of old plantations occupy thousands of acres more or less reserved from exploitation. Recreational preserves, managed primarily for game breeding and hunting, aggregate more than 180,000 acres.[2/] It is estimated that industrial interests, chiefly lumber and pulp companies, own more than 700,000 acres of forest land scattered throughout the unit. The larger of these ownerships occur principally in the pine flatwoods of the coastal counties and include some of the best timber land in the state.

1/ Census of Total and Partial Unemployment, J. D. Biggers, Administrator, Washington, D. C.

2/ Estimated by the Division of State and Private Forestry, Southern Region, U. S. Forest Service, Atlanta, Georgia.

The United States Forest Service through purchase has established the Francis Marion National Forest in Berkeley and Charleston Counties. On June 30, 1938, the gross area within the forest boundary totaled 414,700 acres, of which 243,283 acres were in Government ownership. Other public agencies are estimated to own more than 200,000 acres of forest and farm land in scattered tracts throughout the unit.

When compared to the Piedmont counties farther west, this part of South Carolina is not highly developed industrially. The textile industry, although rated as the leading manufacturing activity, is confined largely to the three western counties. The harvesting and primary manufacture of wood products, although secondary in importance since the rise of the textile industry, is nevertheless a long established business, widely distributed in all counties of the unit. The recent expansion of the pulp industry involving millions of dollars in plant investment and land purchases in this area has stimulated production of forest products especially in the more heavily timbered coastal counties.

Forest description

The aggregate forest area in this Survey unit in 1936 was 4,508,000 acres -- approximately 60 percent of the total land area (table 1). A small fraction of this acreage was classified by the Forest Survey as "nonproductive".3/ This area, chiefly brush covered sand dunes, showed no indications of past cutting and such poor tree growth that the possibility of future timber production is exceedingly remote. Only the 4,498,400 acres of productive forest land are included in the discussion of forest area.

The Forest Survey recognized three major topographic divisions in the forested areas of this unit. Approximately 2 million acres, or 45 percent of the forest area, lies in a broad belt of flatwoods which parallels the coast and extends inland for about 50 miles. Rolling uplands, which characterize most of the inland areas, total approximately 1,100,000 acres, or 25 percent of the forest area. The remaining 30 percent is in wooded swamps and bays of the flatwoods and in alluvial bottomlands of rivers and streams throughout the unit.

Forest Types

Four major tree associations, loblolly pine, longleaf pine, bottomland and swamp hardwoods, and upland hardwoods, representing the grouping of 13 individual forest types, are used in the description of the forest area.

Loblolly pine with its associates, longleaf, shortleaf, and pond pines, red and black gums, oaks, and species of minor commercial importance, occupies nearly half of the total forest area (table 2). Loblolly pine makes up 69 percent of the total cubic-foot volume in this type-group.

3/ See page 27 for explanation of terms.

Table 2. - Productive forest area classified by forest condition and type-group

Forest condition	Type group				Total	Proportion of total
	Loblolly pine[1/]	Longleaf pine	Bottomland hardwood and cypress	Upland hardwood		
	Acres	Acres	Acres	Acres	Acres	Percent
Sawlog size						
Old growth						
Uncut	69,800	7,200	268,800	5,700	351,500	7.8
Partly cut	142,000	55,400	284,900	12,800	495,100	11.0
Total	211,800	62,600	553,700	18,500	846,600	18.8
Second growth						
Uncut	826,500	257,600	287,300	13,600	1,385,000	30.8
Partly cut	385,200	59,400	90,600	8,800	544,000	12.1
Total	1,211,700	317,000	377,900	22,400	1,929,000	42.9
Total sawlog size	1,423,500	379,600	931,600	40,900	2,775,600	61.7
Under sawlog size						
Second growth	572,900	308,900	231,900	151,700	1,265,400	28.1
Reproduction	179,700	64,200	85,100	26,500	355,500	7.9
Clear cut	36,200	50,500	14,400	800	101,900	2.3
Total under sawlog size	788,800	423,600	331,400	179,000	1,722,800	38.3
Total all conditions	2,212,300	803,200	1,263,000	219,900	4,498,400	100.0
Percent of total	49.2	17.9	28.0	4.9	100.0	

[1/] Includes shortleaf pine and pond pine types.

Longleaf pine dominates approximately 18 percent of the forest area. Although the most extensive areas of this type-group occur in the sand hills of Kershaw, Richland, and Chesterfield Counties, the best stands are in smaller, scattered tracts in Georgetown, Charleston, and Berkeley Counties. Loblolly pine, pond pine, and scrub oak are the most common associates, the latter frequently taking over areas of former longleaf pine land to the exclusion of commercially valuable species. This is particularly true in the sand hill section along the western boundary of the unit. The associated species together account for less than 20 percent of the total cubic volume in this type-group.

The remaining 33 percent of the forest acreage is occupied by various hardwood types. The bottomland hardwood type group commonly found in the flood plains of rivers and in the extensive areas of poorly drained swamp occupies 28 percent of the total forest area. The river bottoms are the source of most of the high-quality hardwoods cut in this unit. Red, black, and tupelo gum are the predominant species with oak, cypress, and loblolly pine the principal associates. A lower grade of oaks, gums, and hickories occurs frequently in the rolling uplands scattered among the pine stands. This upland hardwood type occupies an aggregate area of 220,000 acres, less than 5 percent of the total forest area, and includes about 87,000 acres of scrub oak which has completely taken over areas formerly occupied by longleaf pine.

The type map (fig. 1) indicates the general dominance of certain species or groups of species over extensive areas. Within these broad ranges many areas of different but less prevalent forest types occur, as well as large blocks of cultivated land. The acreage dominated by the major type groups as shown on the map, therefore, cannot be compared with area figures shown in table 2.

Forest Conditions

The forest area was classified according to its condition with respect to size, age, and cutting history of the timber (table 2). Sawtimber areas, on which sawlog-size trees predominate, occupy slightly more than 2-3/4 million acres, or 62 percent of the total productive forest area. This acreage of sawtimber was further classified into areas bearing stands of old-growth trees and areas bearing second-growth trees. The old-growth sawtimber area, nearly two-thirds of which is in the bottomland hardwood and cypress type group occuipes 19 percent of the total forest area. More than half of this, nearly 500,000 acres, has been culled for selected species and high quality trees. To consumers of high-quality timber the gradual depletion of the old-growth timber is probably the most significant change now taking place in the forests of the unit.

Second-growth stands predominate in the sawlog-size condition in all but the bottomland hardwood and cypress type-group. At the time of inventory almost two million acres were classified in this condition. Partial cuttings had occurred on 544,000 acres. Loblolly pine, with its principal associates -- longleaf pine, red gum, and pond pine -- make up 82 percent of the sawtimber volume in these forest conditions.

The under-sawlog-size condition contains three sub-divisions: (1) second growth, under-sawlog-size, (2) reproduction, and (3) clear-cut. The first of these is typical of areas where the predominant stand has advanced beyond the seedling stage but has not yet attained the size or volume necessary to produce sawlogs. Occupying slightly more than 1¼ million acres, this condition represents 28 percent of the forest area. The reproduction condition includes only those areas on which a new forest cover recently has become established. Occurring principally in the pine stands, this condition occupies only 8 percent of the forest area. The clear-cut condition, having less than 80 seedlings per acre, and insufficient volume or number of stems to qualify for any other forest condition, covers a total of 101,900 acres or 2 percent of the forest area. This is

a relatively low proportion in comparison with other coastal survey units in the deep South particularly in Florida and Louisiana. The clear-cut area occurs as small tracts scattered throughout the unit. Nearly one half is in the longleaf pine type, chiefly in the sand hills.

A closer appraisal of forest conditions with regard to stocking and stand density discloses widespread deficiencies on much of the forest area. Probably the most outstanding of these deficiencies, because of its striking appearance rather than economic importance, is the 101,900 acres of forest land classified as clear-cut. Presenting problems of fire protection and perhaps direct planting in order to make them again reasonably productive, these clear-cut areas place upon their owners the financial burdens common to more productive forest lands without possessing the benefits of an immediate liquid asset or a growing resource.

In the large area of second growth many of the stands, particularly pine in the younger age-classes, are understocked. Heavy cutting and repeated fires have resulted in widely spaced stands with often an excessive number of poorly formed trees and inferior species. This condition is well illustrated by comparison of the average volume per acre (in cords) on uncut pine areas in representative age-classes, with average volumes weighted by site on the best 10 percent of the area in these types and age-classes.

Age class	Average volume per acre uncut conditions		Relation all pine types to best 10 percent
	All pine types	Best 10 percent of pine types	
	Cords	Cords	Percent
21-30	6.5	19.2	34
41-50	15.5	35.6	44
61-70	19.5	42.0	46

The fact that 10 percent of the pine area in these age-classes and conditions already supports such large stands is evidence that these densities of stocking are not unattainable objectives and further indicates the results that may be obtained through protective measures and reasonable management.

The rapid reduction of the old-growth acreage in the last 50 years has resulted in an unbalanced distribution of the forest area among the various size and age classes of timber. Instead of a desirable proportional distribution of acreage among all age classes, an excess has developed in the age-classes between 20 and 50 years, and a deficiency in the acreage of the more mature timber. Such a situation, although having little effect on the total volume of wood available each year, tends to place an increasingly high premium on old-growth timber and necessitates the readjustment or removal of a number of commercial forest enterprises.

Volume Estimates

Estimates of sawtimber volume include only merchantable trees containing timber of a size and quality suitable for sawlogs. The volumes are net log scale -- that is, allowance has been made for material that would be left in the woods because of rot, fire scar, crook, limbiness, and similar defects, as well as for loss in sawing at the mill due to sweep and interior defects.

Table 3. - Net board-foot volume classified by major species groups, according to International ¼-inch, Scribner, and Doyle log rules

Major species group	International 1/ ¼-inch	Scribner	Doyle
	Thousand board feet		
Pines			
Loblolly	6,322,400	5,494,000	3,934,100
Longleaf	1,341,000	1,114,200	697,500
Pond	545,700	467,000	316,200
Shortleaf	315,000	262,900	165,500
Total pines	8,524,100	7,338,100	5,113,300
Hardwoods			
Red gum	1,714,000	1,584,400	1,338,200
Black gum	1,074,400	987,400	771,800
Tupelo gum	429,300	396,200	326,100
Red oaks	620,000	573,500	489,700
White oaks	397,900	372,100	329,100
Ash	282,500	258,800	206,600
Others	883,400	797,700	629,600
Total hardwoods	5,401,500	4,970,100	4,091,100
Cypress	896,800	800,200	590,300
Total all species	14,822,400	13,108,400	9,794,700

1/ The scale by International ¼-inch rule closely approximates green lumber tally.

The total net board-foot inventory is expressed in terms of three major log rules in table 3. Although the Doyle rule is used most commonly by the lumber industry, it is not a true measure of all standing timber throughout the wide range of tree diameters included in the inventory. The Scribner rule, now widely used by the United States Forest Service, although more accurate, likewise is faulty as a measure for mixed tree sizes. The closest approximation to actual recoverable volume for all-sized trees that may be computed through the use of log rules is that offered by the International ¼-inch log rule which is used in subsequent board foot tables in this report. Comparison of the Doyle and International estimates in table 3 discloses that the total volume according to Doyle rule is but 66 percent of that as measured by the International rule.

Of the 14.8 billion board feet inventoried in 1936, 58 percent was pine, 36 percent hardwoods, and 6 percent cypress (table 4). Loblolly pine is the predominant species in the unit, comprising 74 percent of the pine volume and 43 percent of the total sawtimber volume in all species. Among the hardwoods red gum is the leading species with a volume of nearly 1-3/4 billion board feet or 32 percent of all hardwood volume. With black and tupelo gum accounting for another 28 percent, the three gum species together make up about 60 percent of all the hardwood sawlog volume in the unit.

One-fourth of the pine volume and nearly three-fourths of the hardwood and cypress volume occur in the old-growth condition. This does not mean, however, that all of the volume in the old growth condition class is high quality material. Over half of the pine volume and over one-third of the hardwood and cypress volume in this condition occurs on "partly cut" areas indicating that these areas have been culled for selected species and high grade trees. In other instances, the old-growth consists of over mature stands or stands on poor sites which do not contain a high proportion of quality timber. The volume in old-growth conditions also includes the volume of second growth trees occurring on these areas. The old-growth pine is found chiefly in small scattered tracts throughout the central and eastern portions of the unit. Old growth hardwoods and cypress is confined to the bottomlands and swamps bordering the larger rivers, particularly the Santee, Wateree, and Pee Dee.

Practically all of the sawtimber volume shown in table 4 is accessible. The large bottomland swamps require special logging equipment but it is rare to encounter any physical obstacle to logging which modern machines and methods can not overcome. The more serious hindrances to harvesting timber are economic in nature and are closely associated with ownership and its policies, market conditions, stand quality and age, and stocking or stand density. A graphic analysis of the latter item may be considered an index to economic availability and is shown in figure 2 for the sawlog-size stands of the pine and hardwood type groups. In the former, the distribution of 8,370,300 M board feet on 1,803,100 acres is shown in volume-per-acre classes. Twenty-seven percent of the area in the pine type groups is occupied by stands with less than 2,000

Table 4. - Net board-foot volume classified by species group and forest condition

International ¼-inch rule

Species group	Forest condition					Total	Proportion of total
	Sawlog size				Under sawlog size[1]		
	Old growth		Second growth				
	Uncut	Partly cut	Uncut	Partly cut			
	Thousand board feet						Percent
Pines							
Loblolly	726,100	715,300	3,723,100	966,500	191,400	6,322,400	42.7
Longleaf	53,800	279,000	741,200	160,200	106,800	1,341,000	9.0
Pond	121,200	83,000	243,100	67,500	30,900	545,700	3.7
Shortleaf	58,200	38,600	133,100	66,300	18,800	315,000	2.1
Total	959,300	1,115,900	4,840,500	1,260,500	347,900	8,524,100	57.5
Hardwoods							
Red gum	946,100	261,900	371,100	112,400	22,500	1,714,000	11.6
Black gum	399,700	412,200	187,300	56,000	19,200	1,074,400	7.3
Tupelo gum	202,300	189,400	27,400	6,600	3,600	429,300	2.9
Red oak	211,800	132,100	206,100	61,900	8,100	620,000	4.2
White oak	187,500	136,600	44,500	22,800	6,500	397,900	2.7
Ash	184,500	40,900	48,600	6,000	2,500	282,500	1.9
Others	311,200	235,000	254,300	60,900	22,000	883,400	5.9
Total	2,443,100	1,408,100	1,139,300	326,600	84,400	5,401,500	36.5
Cypress	466,900	204,400	171,400	39,300	14,800	896,800	6.0
Total all species	3,869,300	2,728,400	6,151,200	1,626,400	447,100	14,822,400	100.0
Percent of total	26.1	18.4	41.5	11.0	3.0	100.0	

1/ Includes 64 million board-feet on the areas classified as reproduction and clear cut.

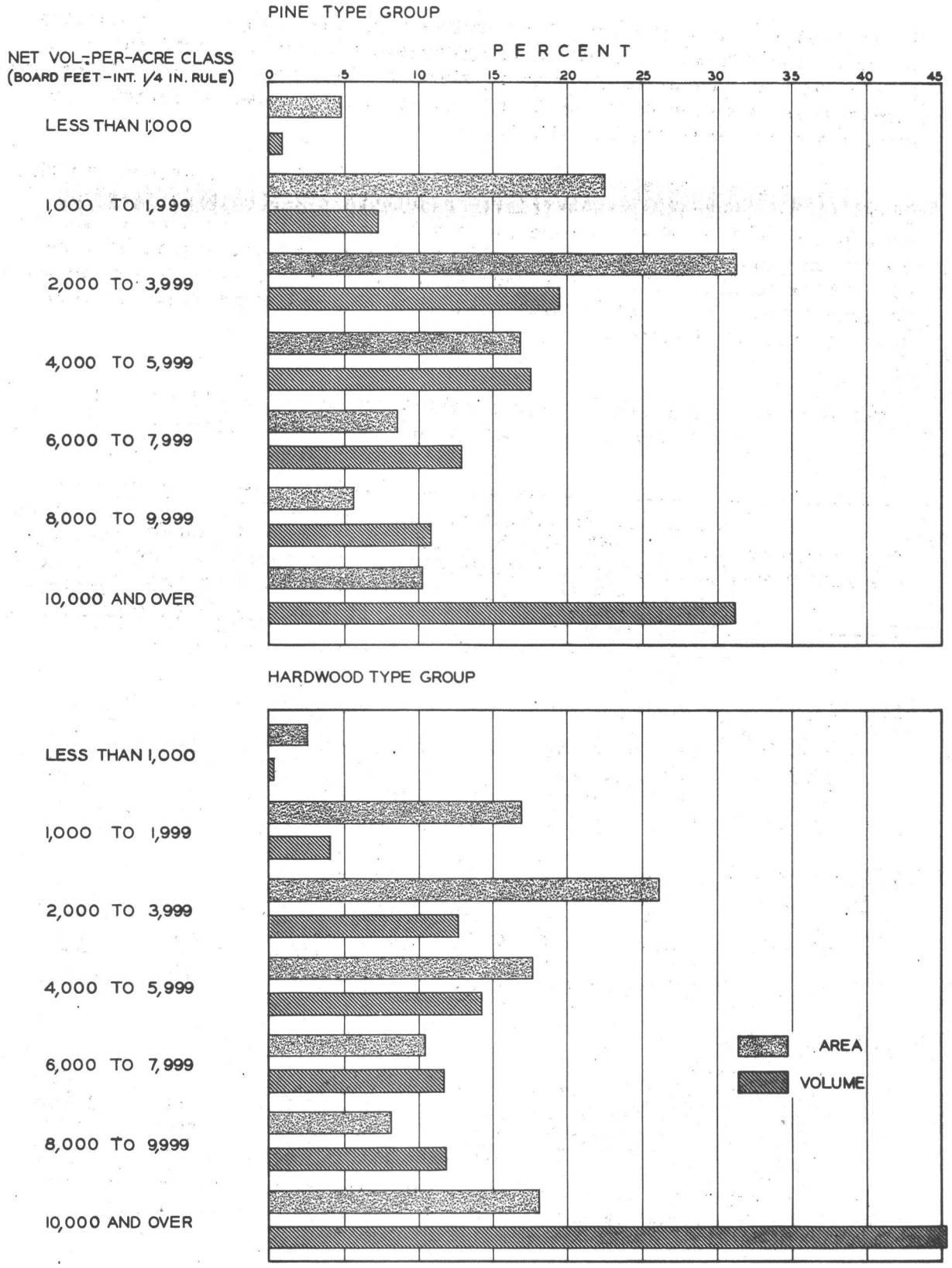

FIGURE 2.- PROPORTIONAL DISTRIBUTION OF AREA AND BOARD-FOOT VOLUME IN THE SAWLOG-SIZE CONDITIONS BY VOLUME-PER-ACRE CLASSES

board feet per acre and contains 8 percent of the volume. If a density of 2,000 board feet per acre is considered a minimum for profitable logging other factors being favorable, then nearly three-quarters of the sawtimber area carrying nine-tenths of the volume in these important type groups offers operating possibilities.

In the sawlog-size conditions of the hardwood type groups, which includes the cypress type, stands with less than 2,000 board feet per acre occur on less than 20 percent of the total sawtimber area in these conditions and type groups. Comparison of the heaviest stands of pine with hardwood shows that a substantially higher proportion of the hardwood sawtimber occurs in densities of 10 M or more board feet per acre than is true of the pine.

Table 5. - Average net sawtimber volume per acre classified by type group, species group, and forest condition

Type group and species groups	Forest condition: Sawlog size: Old growth: Uncut	Old growth: Partly cut	Second growth: Uncut	Second growth: Partly cut	Average all sawlog size conditions	All under sawlog size conditions	Weighted average all conditions
	Board feet per acre						
Pine type							
Species group							
Pine	10,030	5,040	4,330	2,750	4,260	260	2,660
Hardwood	1,230	540	330	280	380	20	230
Total	11,260	5,580	4,660	3,030	4,640	280	2,890
Hardwood type[1]							
Species group							
Pine	680	400	480	370	500	50	350
Hardwood	10,260	5,060	3,170	2,430	5,670	150	3,770
Total	10,940	5,460	3,650	2,800	6,170	200	4,120
Average all types							
Species group							
Pine	2,730	2,250	3,490	2,320	2,950	200	1,900
Hardwood	8,280	3,260	950	670	2,230	60	1,400
Total	11,010	5,510	4,440	2,990	5,180	260	3,300

1/ Includes cypress type.

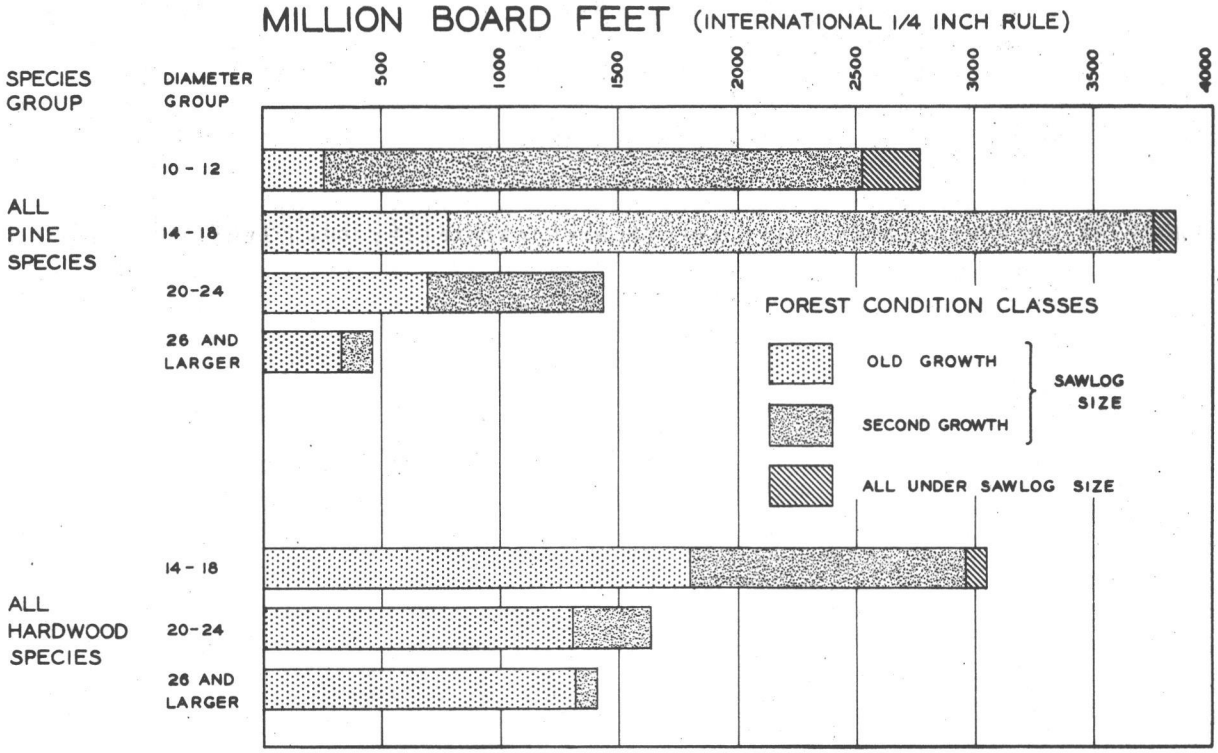

FIGURE 3.- DISTRIBUTION OF NET BOARD-FOOT VOLUME BY DIAMETER GROUP AND FOREST CONDITION

For purposes of comparison with similar forest conditions and species groups in other forested areas of the South, the data in table 5 are significant. Old-growth uncut pine in the pine type group averages more than 10 M board feet per acre, and the average for these species in all sawlog-size conditions is 4,260 board feet per acre. The volume of hardwoods in hardwood types ranges from 2,430 to 10,260 board feet per acre in the sawlog-size conditions, with an average of 5,670 board feet per acre for the four sawlog-size conditions. The average stand for all types together runs heavily to hardwoods in the old-growth conditions and heavier to pines in the second-growth conditions. The average for sawlog stands, regardless of type group or species, is 5,180 board feet per acre, and for the entire forest area 3,300 board feet per acre. These averages are larger than similar figures for any other coastal Survey unit in the South.[4/]

Figure 3 illustrates a further classification of the total net board foot volume according to diameter groups and forest conditions. In the pine species the largest proportion of board foot volume in the 10 and 12-inch diameter classes is in the second-growth, sawlog size condition, although considerable volume in these tree sizes occurs in the old-growth

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4/ Forest Survey Releases 26 and 29, Southern Forest Experiment Station, New Orleans, La.

and in the under-sawlog-size conditions. In the larger diameters, the volume derived from the under-sawlog-size conditions becomes negligible. In the 20 to 24-inch diameter classes the ratio between old-growth and second-growth is about even, and in the diameter groups 26 inches and over the old-growth condition is the leading source of all pine volume.

Among sawlog-size hardwoods, including a small volume of cypress, the 14 to 18-inch diameter groups are derived chiefly from the old-growth condition. The second-growth hardwood stands appear to be of less importance as an immediate source of sawtimber than the corresponding pine stands, particularly the diameter classes 20 inches and larger.

Cordwood Volumes

Table 6 shows the volume of all sound material expressed in standard cords.5/ These volumes are derived from the following sources:

1. The sawlog portion of sawtimber trees.

2. That portion of sawtimber trees not usable as sawlogs but acceptable as cordwood. This includes the upper stems of pines, and the upper stems and limbs of hardwoods and cypress to a minimum diameter limit of 4 inches outside bark.

3. The sound under-sawlog-size trees at least 5 inches d.b.h. in which the entire stem is included to a variable top diameter not less than 4 inches outside bark.

4. The estimated sound material in cull trees.

Deductions for cull include only the volume in defects which cause the material to be unsuited for cordwood. Sweep and slight crook are not regarded as defects.

Accessibility and economic availability of the cordwood volume depend upon many of the same factors that affect sawtimber, although the smaller average size of the trees and the lower quality permissible in marketing this class of material increases the quantity acceptable. The estimated volume in tops, approximately 11,820,000 cords, is available only as the trees are cut for lumber, cordwood or other use. A few companies use the tops following pulpwood or logging operations, but the practice is by no means general and only a small part of the volume in tops is utilized. The fact that 57 percent of the total cordwood volume occurs in the hardwood species indicates opportunities for more intensive use of these species. The large volume of cull black and tupelo gum is particularly significant as these species are becoming increasingly impor-

5/ Standard cord is equivalent to 128 cubic feet (4' x 4' x 8') of stacked bolts including bark.

tant as pulpwood and the cull material, occurring chiefly in pure stands in the "gum heads" is suitable only for this use.

Table 6. - Net cordwood volume classified by species group and source of material

Species group	Source of material				Total	Proportion of total
	Sawlog material	Tops of sawlog size trees[1]	Under sawlog size trees	Cull trees		
	Cords					
Pines:						
Loblolly	13,855,600	2,538,400	2,811,300	385,100	19,590,400	26.3
Longleaf	3,133,100	747,400	1,475,400	61,600	5,417,500	7.3
Other pines	1,995,000	481,600	679,300	142,000	3,297,900	4.4
Total pines	18,983,700	3,767,400	4,966,000	588,700	28,305,800	38.0
Hardwoods:						
Red gum	3,897,800	2,376,800	2,069,700	799,300	9,143,600	12.3
Black gum	2,979,200	1,483,900	4,580,600	2,370,500	11,414,200	15.3
Tupelo gum	1,153,500	596,000	695,600	1,083,900	3,529,000	4.7
Oaks	2,619,200	1,413,700	1,774,900	2,791,900	8,599,700	11.5
Other hardwoods	2,909,400	1,580,600	3,070,200	2,613,000	10,173,200	13.6
Total hardwoods	13,559,100	7,451,000	12,191,000	9,658,600	42,859,700	57.4
Cypress:	2,096,700	601,200	396,400	316,100	3,410,400	4.6
Total all species	34,639,500	11,819,600	17,553,400	10,563,400	74,575,900	100.0
Percent of total	46.5	15.8	23.5	14.2	100.0	

[1] Includes the usable portion of the upper stems of pines and of the upper stems and limbs of hardwoods and cypress to a minimum diameter of 4 inches outside bark.

The total inventory is also shown in a condensed form in table 7 expressed in cubic feet.

Table 7. - Net cubic foot volume (inside bark) of all material classified by species group and source - 1936

Species group	Source of material				Total	Proportion of total
	Sawlog-size trees		Under saw-log size trees	Cull trees		
	Sawlog material	Tops[1]				
	Thousand cubic feet					Percent
Pines	1,380,540	270,710	328,170	42,080	2,021,500	40.4
Hardwoods	919,650	443,550	776,140	592,500	2,731,840	54.6
Cypress	163,120	36,550	28,330	24,200	252,200	5.0
Total	2,463,310	750,810	1,132,640	658,780	5,005,540	100.0
Percent of total	49.2	15.0	22.6	13.2	100.0	

1/ Includes the usable portion of the upper stems of pines and of the upper stems and limbs of hardwoods and cypress to a minimum diameter limit of 4 inches outside bark.

Poles and Piles

A conservative estimate was made of the number of pine trees suitable for poles and piles. These premium trees occur as scattered individuals throughout the area but are most common in the uncut second-growth stands in the lower Coastal Plain counties. Of the 11,760,000 sticks (table 8), nearly three-fourths fell in the 20 and 25-foot length classes. Since many of these trees will be cut for lumber or pulpwood instead of poles, the table is chiefly significant as an indicator of the relative occurrence of poles by length and diameter classes in the pine stands of the unit.

Table 8. - Total number of pine poles and piles classified by length and diameter

Diameter class[1]	Length in feet						Total	Proportion of total
	20	25	30	35	40	45+		
Inches	Thousand sticks							Percent
7.0 - 8.9	2,568	520	96	--	--	--	3,184	27.1
9.0 - 10.9	2,121	854	433	286	--	--	3,694	31.4
11.0 - 12.9	979	796	568	318	125	32	2,818	24.0
13.0 - 14.9	148	510	427	193	77	86	1,441	12.2
15.0 - 16.9	--	141	190	83	38	55	507	4.3
17.0 - 18.9	--	13	55	19	10	19	116	1.0
Total	5,816	2,834	1,769	899	250	192	11,760	100.0
Percent of total	49.5	24.1	15.1	7.6	2.1	1.6	100.0	

[1] Diameter 4½ feet above ground, outside bark.

Forest Increment

Although the forest area has been described and classified as the Forest Survey found it in 1936 and its aggregate volume estimated as of January 1, 1937, these conditions must not be considered as static. Forest growing stock volume is an ever-changing quantity subject to the influences of a complex pattern of physical factors. Excluding the factor of cutting, the growth of individual merchantable trees in a stand and the additional volume recruited from young trees bring about a natural tendency toward increase in volume. Opposing these elements of increase, the factor of mortality constantly operates to remove volume, thereby reducing, or possibly entirely off-setting, any possible increase. The composite effect of these contrasting elements on stand volume over a given period is the net increment for that period. During 1936 the total growth that accrued to the forests of this unit, amounted to 786,300,000 board feet (table 12). Deducting the mortality of 130,500,000 board feet leaves a net increment, exclusive of commodity drain, of 655,800,000 board feet. Similarly, the cubic-foot growing stock has a gross growth of 180,360,000 cubic feet; mortality amounted to 40,270,000 cubic feet, leaving a net increase of 140,090,000 cubic feet (table 13).

The item of mortality is the volume lost annually through the death of trees as a result of overcrowding, fire, disease, insect attack, windthrow or other causes. In 1936 it amounted to approximately 17 percent of the gross board-foot growth and 22 percent of the gross cubic-foot growth. A substantial part of this loss is due to death through competition, and is a normal and desirable characteristic of stand development on forest properties not under intensive silvicultural management. Much of the loss, however, is due to unnatural causes, principally fire, which is particularly damaging to the seedlings and saplings and also takes a heavy annual toll of merchantable trees. As an indirect factor, fire damage is responsible for a considerable proportion of the losses directly chargeable to other causes, in that disease, insect attack, and windthrow frequently follow in severely burned stands.

While mortality cannot be eliminated, a substantial reduction in the loss can be realized through control of fire and through utilization of damaged and suppressed trees.

Table 9. - Average net increment per acre classified by forest condition and type of material - 1937

Forest condition	Sawlog-size material			All sound material	
	Pines	Hardwood	Total	Including bark	Excluding bark
	Board feet			Cords	Cu. ft.
Sawlog-size:					
Old growth					
Uncut	33	146	179	.37	25.7
Partly cut	46	89	135	.41	28.1
Second growth					
Uncut	204	44	248	.69	47.7
Partly cut	129	46	175	.51	35.3
Under sawlog-size:					
Second growth	68	8	76	.40	26.3
Reproduction and clear cut	8	1	9	.03	1.8
Weighted average all conditions	106	43	149	.46	31.6

An analysis of the net increment on a per-acre basis by forest conditions and broad species groups (table 9) affords a clearer picture of forest growth and serves as a basis for comparison with similar forest areas in the South. The weighted average board-foot increment per acre in this unit, 149 board feet, exceeds by a substantial margin comparable figures in other coastal plain Survey units in the South, the closest being 118 board feet per acre in southwest Alabama.6/

Economic Aspects

The amount of industrial and domestic drain to which the forest is subjected each year is perhaps the best measure of the usefulness of this resource to the individuals and communities of the area. The magnitude of the industrial structure which the resource supports, the capital investment, employment, wages and profits, as well as more indirect benefits, establish the whole business of wood utilization as an important component in the economic life of the area.

Wood-using Industries

During the summer of 1937 a complete survey of the forest industries was made, to determine production in the calendar year 1936. This included the production of lumber, veneer, cooperage, pulpwood, and piece products, as well as the estimated amount of fuelwood cut for both commercial and domestic purposes.

The 267 sawmills operating during some portion of the year 1936 produced 410,500,000 board feet of lumber. Two hundred twenty-six, or 85 percent of these mills, were the portable type cutting from one to 10 M board feet per 10-hour day. These small mills cut 43 percent of the entire 1936 lumber production. Such mills generally operate in wood-lots and in tracts of timber where small private ownerships predominate. In this Survey unit there was concentration of small mills in Richland, Kershaw, and Chesterfield Counties, and a smaller group in the northeast section of Horry County (fig. 4). In the remaining counties, except those along the coast, there is a fairly uniform distribution of these mills. Where forest land is held in large tracts by lumber companies, pulp mills, game clubs, estates, or the Federal Government as in Charleston, Berkeley, and Georgetown Counties, there are few portable mills. The presence of large numbers of such mills in a region is a typical symptom of the stage reached in the exploitation of its forest resources, since they are commonly found where the available timber is too young, too widely scattered or too low in quality to be cut profitably by the larger mills. Moreover, a large number of small mills is evidence that the industry has passed through the era of large sawmills, and that an adjustment is being brought about which is gradually accommodating the methods of lumber manufacture to an altered form of resource material.

6/ Forest Survey release No. 35, Southern Forest Experiment Station.

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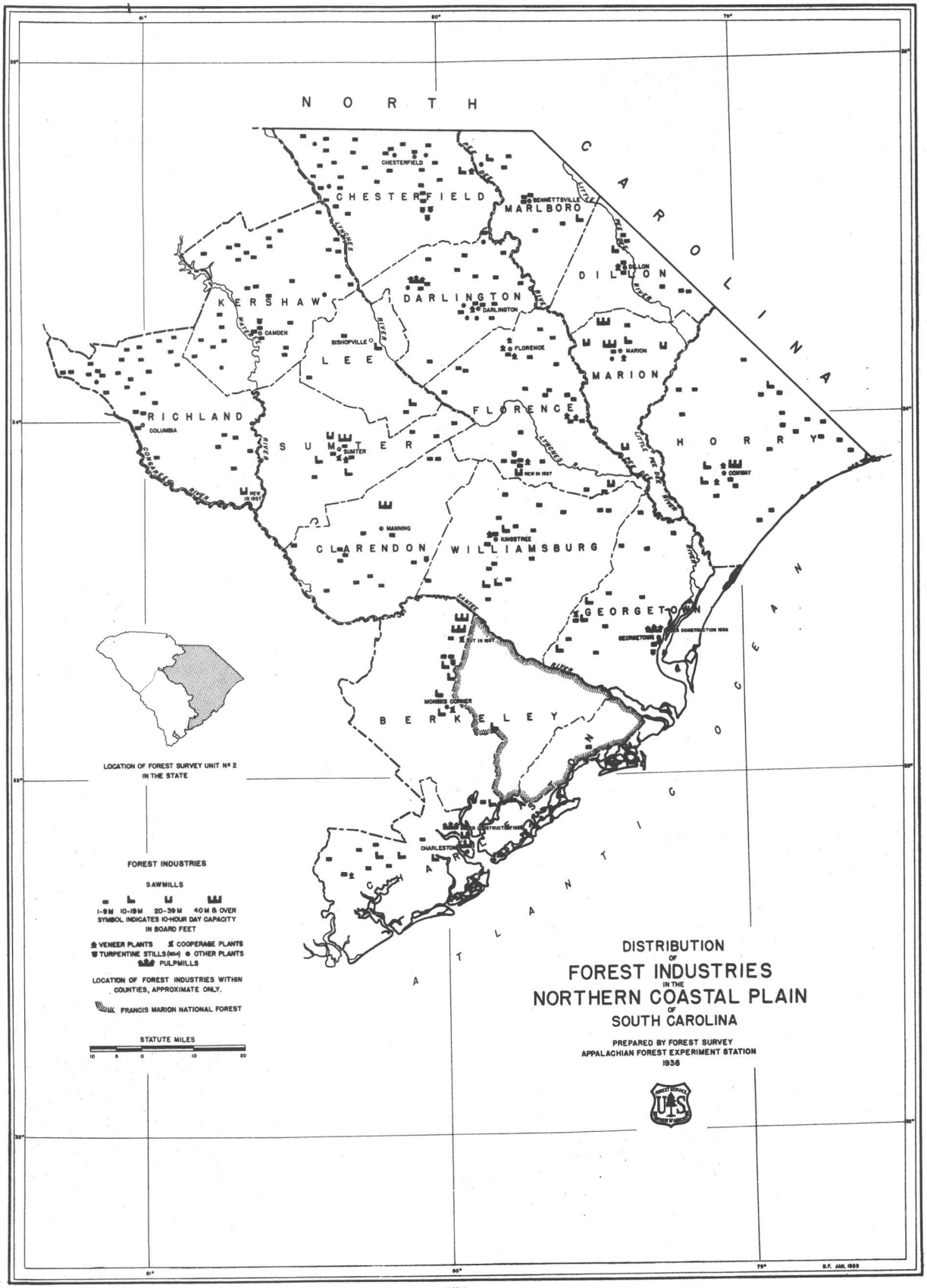
NORTH CAROLINA
CHESTERFIELD
MARLBORO
DILLON
KERSHAW
DARLINGTON
LEE
FLORENCE
MARION
RICHLAND
SUMTER
CLARENDON
WILLIAMSBURG
HORRY
GEORGETOWN
BERKELEY
CHARLESTON
ATLANTIC OCEAN
LOCATION OF FOREST SURVEY UNIT Nº 2 IN THE STATE
FOREST INDUSTRIES
SAWMILLS
1-9 M 10-19 M 20-39 M 40 M & OVER
SYMBOL INDICATES 10-HOUR DAY CAPACITY IN BOARD FEET
VENEER PLANTS COOPERAGE PLANTS
TURPENTINE STILLS (1934) OTHER PLANTS
PULPMILLS
LOCATION OF FOREST INDUSTRIES WITHIN COUNTIES, APPROXIMATE ONLY.
FRANCIS MARION NATIONAL FOREST
STATUTE MILES
10 5 0 10 20
DISTRIBUTION OF FOREST INDUSTRIES IN THE NORTHERN COASTAL PLAIN OF SOUTH CAROLINA
PREPARED BY FOREST SURVEY
APPALACHIAN FOREST EXPERIMENT STATION
1936

Figure 4

The 33 medium size mills, cutting 10 to 40 M board feet per day, accounted for 23 percent of the 1936 lumber production in this Survey Unit. There were only 8 mills cutting 40 M board feet or more per day, but they produced almost 34 percent of the total lumber cut. Thirty-four non-lumber plants scattered throughout the unit produced veneer, shingles, cooperage, furniture, and paper pulp. The production of fuelwood, crossties, and poles and piling rank high among the forest industries. The production of fuelwood alone, including wood for tobacco curing, constitutes a wood use second only to lumber in volume consumed. Approximately 60 percent of the fuelwood is cut from the stems of living sound trees, the remainder coming from cull and dead trees and from limbwood.

Table 10. - Production and employment in the primary wood-using industries - 1936

Commodity	Number of plants	Quantity produced	Employment		
			In woods	At plants	Total
			- - - Thousand man-days - - -		
		M bd. ft.			
Lumber	267	410,500	541	748	1,289
Veneer	15	76,900	145	298	443
Shingles	12	4,500	9	10	19
		Pieces			
Poles and piles	--	189 M	42	--	42
Crossties	--	292 M	41	--	41
		Cords			
Other commercial uses 1/	7	66 M	70	83	153
Fuelwood 2/	--	948 M	1,138	--	1,138
Domestic farm use 3/	--	39 M	43	--	43
Total			2,029	1,139	3,168

1/ Includes 4 cooperage plants, 2 furniture factories, and 1 pulp mill.

2/ Includes fuelwood for tobacco curing.

3/ Includes fence posts and other farm items exclusive of fuelwood.

The labor requirements of these industries totaled more than three million man-days in 1936 (table 10). Forty-one percent of the employment was provided by the lumber industry, 36 percent by the fuelwood industry, and the remaining 23 percent by the smaller commercial plants and domestic activities. On the basis of 250 working days per year, regular full-time employment was provided for more than 12,000 workers, but with many part-time employees particularly in the woods, the actual number receiving employment in the wood using industries was probably several times this number.

Naval Stores

At one time a major forest industry in this part of South Carolina, the naval stores industry has been reduced during the past few decades to one of comparatively minor importance. Only 8 turpentine stills were operating in 1936 (fig. 4). The activities of the stills and the 68 gum producers without stilling facilities provided about 50,000 man-days of employment. The supply of unworked or "round" timber available for Naval Stores operations is ample for present requirements, or for a moderate expansion, but the attitude of the timber owners, together with the general depressed condition of the turpentine and rosin markets, does not encourage new ventures in this field.

Commodity Drain

The total annual cut from the forest growing stock of the unit, regardless of destination or point of manufacture, together with the incidental woods waste, constitutes the commodity drain. Table 11 lists the total forest drain classified according to general species groups and commodity. For purposes of comparison the drain for all commodities derived from sawlog material is listed in board feet. Cubic foot measure is used to express the drain from all sizes of sound trees 5" in diameter and larger.

Table 11. - Commodity drain from sound trees - 1936

Commodity	Sawlog size material			All material		
	Pine	Hard-wood	Total	Pine	Hard-wood	Total
	Thousand board feet			Thousand cubic feet		
Lumber	303,100	103,300	406,400	55,340	16,470	71,810
Veneer	12,800	69,100	81,900	2,330	11,070	13,400
Shingles	2,600	1,900	4,500	480	290	770
Other commercial use	2,900	11,700	14,600	940	2,360	3,300
Poles and piles	16,800	--	16,800	3,060	--	3,060
Crossties	7,600	7,900	15,500	1,400	1,260	2,660
Fuelwood	61,500	28,300	89,800	24,700	15,250	39,950
Domestic farm use	3,900	1,100	5,000	2,060	580	2,640
Total	411,200	223,300	634,500	90,310	47,280	137,590

Lumber is the leading drain item, with fuelwood ranking second, veneer third. Approximately 47 percent of the total fuelwood drain came from sawtimber trees, in spite of the fact that there were standing in the forests of the unit a sound volume in cull trees of more than 10½ million cords. About 13 percent of the cubic foot drain was used in the manufacture of veneer, shingles, furniture, cooperage, and paper pulp. Another 4 percent went into poles, piles, and crossties.

The new pulp mills in Charleston and Georgetown were under construction in 1936 and their wood requirements were not included in the drain figures for this report. These two mills are reported to have a combined capacity in excess of 450,000 cords annually, and at capacity operation should provide about one million man-days of labor.

The Balance between Increment and Drain

Having described the forest, estimated its volume and increment, and determined its natural and commodity drain as of 1936, the foundation is laid for an analysis of these elements which show the status of the forest resources for that year. The net change in the amount of growing stock between January 1, 1936, and January 1, 1937, and the factors responsible for it are summarized in tables 12 and 13. In the sawtimber material (table 12) the hardwood growing stock was reduced by more than 32 million board feet. Sawlog-size pine growing stock, conversely, was increased by more than 53 million board feet, a volume sufficient to offset the reduction in the hardwood species and bring about a unit-wide increase of more than 21 million board feet.

Table 12. - Comparison between increment and commodity drain - sawtimber material

	Pine	Hardwood	Total
	- - - - Thousand board feet - - - -		
Growing stock, January 1, 1936	8,470,500	6,330,600	14,801,100
Growth	531,700	254,600	786,300
Mortality	66,900	63,600	130,500
Forest increment	464,800	191,000	655,800
Commodity drain	411,200	223,300	634,500
Net change in growing stock, 1936	+53,600	-32,300	+21,300
Growing stock, January 1, 1937	8,524,100	6,298,300	14,822,400

The 21 million board foot surplus indicates a favorable balance for one year only - 1936 - and should not be construed as indicative of the existence of any positive trends in the supply of forest growing stock. Even though, for example, the hardwood growing stock was decreased and the pine growing stock increased in 1936, it does not follow that the same conditions existed in 1935 nor in 1937. Until a series of annual balances can be posted no definite indication of trends may be delineated. There are, however, a number of economic factors which had a significant bearing on the 1936 balance, and others will probably affect subsequent balance sheets.

Forest industries, particularly the lumber mills, although experiencing their best year since 1930, nevertheless operated below their 1920-1930 average. Many of the smaller mills operated only a few days during the year or not at all, so that the general demand on the forest resources was probably below that which might be expected during an active year. On the other hand, the effects of fire protection are already beginning to show in faster growth and better stocked stands. The effort at forest management and the application of silvicultural measures now being practiced by leading pulp and lumber companies, and by Government agencies should contribute during the next decade to a more favorable balance in the growing stock ledger, provided there is no great increase in wood consumption in the unit.

Of particular importance to the lumber industry is the progressive depletion of the old-growth timber. Analysis of the commodity drain and increment data indicates that these high quality stands, both pine and hardwood, are being cut much faster than they are growing. This situation is not brought out clearly in table 12 because the increment occurring on the younger stands of sawtimber is sufficient to offset the losses in the old-growth stands. Thus, although there is a distinct deterioration in the quality of the timber available, there can be no significant change in the total board foot inventory as long as the rapidly growing second growth can keep pace with the drain and offset the losses in the older age classes.

Although the hardwood sawtimber growing stock suffered a 32 million board foot reduction during 1936, the hardwood stands as a whole, including both sawtimber and the smaller cordwood material, were increased by a small volume. This is shown in table 13, expressed in cubic feet. The pine balance also shows a small increase and the net change in the entire forest growing stock during 1936 was an increase of more than 2½ million cubic feet.

Table 13. - Comparison between increment and commodity drain - all material

	Pine	Hardwood	Total
	- - - - Thousand cubic feet - - - -		
Growing stock, January 1, 1936	1,977,630	1,886,530	3,864,160
Growth	108,760	71,600	180,360
Mortality	16,660	23,610	40,270
Forest increment	92,100	47,990	140,090
Commodity drain	90,310	47,280	137,590
Net change in growing stock, 1936	1,790	710	2,500
Growing stock, January 1, 1937	1,979,420	1,887,240	3,866,660

Here again it should be pointed out that the small surplus in the pine volume does not justify too optimistic a viewpoint. The two new pulp mills, under construction during 1936, had not yet added their demands to the industrial drain from this area. These mills will probably draw one-half of their pulpwood from this unit. If one-half of their estimated combined capacity requirements had been drawn from the unit in 1936, the pine commodity drain would have been increased 17 percent. Instead of a surplus of more than 1-3/4 million cubic feet, as shown in table 13, there would have been a depletion of pine growing stock of about 14 million cubic feet.

Summary and Conclusions

The northern coastal plain of South Carolina is especially adapted to the continuous production of forest products. With nearly 60 percent of the land area forested, climate and soils that favor rapid tree growth, the presence of excellent diversified local markets for forest products, an adequate transportation system augmented by shipping facilities to northern centers, and a rural population available for employment in all types of forest industries, it is evident that the forests and forest industries will continue to rank as important factors in the general economy of this region.

Notwithstanding three centuries of indiscriminate timber cutting, land clearing, and until recently, little or no protection from fire, much of the present forest area is in remarkably good condition. At the time of the field survey 62 percent of the forest area was in the sawlog-size condition -- either second growth or old growth. Stands of 2,000 board feet or more per acre, which may be considered operable, occur on 47 percent of the forest area. The aggregate area classified as clear cut, where little or no stocking exists, amounts to only two percent of the total forest area, a comparatively low proportion with respect to other Forest Survey units in the South.

Despite the favorable situation these conditions appear to indicate, there are extensive areas where much improvement could be realized under more adequate fire protection and reasonable management. One-fourth of the area in the sawlog-size conditions has timber stands of less than 2,000 board feet per acre. The clear-cut area of almost 102,000 acres is producing practically nothing. Moreover, much of the area in both sawlog-size and under sawlog-size conditions is yielding but half the site capacity, and the presence of cull trees, inferior species, or worked-out turpentine trees materially lowers the value of the stands.

The comparison of growth and drain indicates that the forests as a whole, in their present condition, probably can support a demand equivalent to the 1936 requirements, which excludes the two pulp mills, without depleting the growing stock. Some adjustment would have to be made, however, in manufacturing methods and plant capacities to offset the declining volume of old-growth timber and to make efficient use of the smaller second-growth material. The small margin of increment over drain allows no provision for expansion of industry or for such exigencies as unusually bad fire years or insect epidemics, nor does it provide the surplus growth

necessary to build up understocked stands. The requirements of the two new pulp mills alone will more than offset the surplus increment and result in a depletion of forest capital unless net growth can be increased sufficiently to offset this additional drain through a reduction in mortality and an increase in growing stock.

The forests of the unit are capable of producing adequate timber to meet these additional requirements and to allow for even further industrial expansion in future years, but concerted action will be necessary, on the part of both public and private agencies to attain this desirable objective. The primary step is to increase stocking through adequate fire protection and improved cutting practice designed to build up and maintain the forest in a reasonably productive condition.

Good progress has been made along these lines in recent years. The South Carolina State Commission of Forestry in cooperation with the U. S. Forest Service has established fire protection areas in all but two counties in this Survey Unit and the beneficial results are already evident. Including the acreage in the Francis Marion National Forest approximately 64 percent of the forested area is under organized protection. The Forest Management Division of the State Forestry Commission and the State Extension Service have been active in reforestation and have given advice to timberland owners regarding management of their holdings.

In the Francis Marion National Forest nearly 245,000 acres have been placed under a definite plan of management for the production of high quality sawtimber with intermediate cutting for pulpwood and other products. This area provides a large scale demonstration of the approved principles of timberland management.

The new pulp mills established on the coast have purchased large areas of forest land, over 200,000 acres in this unit, and have placed them under management to assure a continuous supply of pulpwood for their mills. Cutting rules to govern contractors working on company and other private lands have been adopted with a view toward integrated and complete utilization of their timber stands. Other forest owners, including lumber companies, estates and hunting clubs have initiated various forms of conservation measures on their properties.

These are encouraging indications that timber owners are beginning to realize the value of forest management. Much remains to be done, however. An extension of the educational program directed toward all forest land owners, particularly farmers, stressing fire protection and woodland management seems vitally necessary. The united efforts of public agencies with the cooperation of the industries and the forest land owners should, in a reasonable time, develop the forest resources of the unit to the point where they assume their full share of responsibility in the economic welfare of this region.

GLOSSARY

EXPLANATION OF TERMS

Forest survey unit. -- A subdivision of a state of from 6 to 10 million acres in which forest, topographic and economic conditions are reasonably homogeneous.

Non-productive forest area. -- Forest land that does not have the qualities necessary for the production of commercial timber.

Cropland. -- Land being used for the production of farm or orchard crops, or showing evidence of having been so used during the preceding 5 years, and still in such condition that it can be easily cultivated.

Abandoned cropland. -- Land formerly cultivated or pastured now showing distinct signs of having been abandoned for such use.

Improved pasture. -- Cleared or open land under fence, used primarily for grazing.

D.B.H. -- Diameter breast high. The diameter outside the bark of a tree measured at a point 4½ feet above the ground.

Diameter class. -- All trees were recorded in 2-inch diameter classes, that is, trees measuring 5.0 to 6.9 inches d.b.h. are in the 6-inch diameter class.

Merchantable tree. -- Any sound, well formed tree that is, or gives promise of becoming, a sawtimber tree.

Cull tree. -- One that, because of form, limbiness, rot, or similar defect, will not qualify as a merchantable tree.

Sawtimber tree. -- The following minimum requirements are necessary for hardwoods: 13.0 d.b.h., at least one sound butt log 12 feet long, or 50 percent of the gross volume of the tree in sound sawtimber material; for pine and cypress, at least 9.0 inches d.b.h., at least one sound butt log 12 feet long, or 50 percent of the gross volume of the tree in sound sawtimber material.

Under-sawlog-size tree. -- A merchantable pine or cypress measuring 5.0 to 8.9 inches d.b.h., a merchantable hardwood tree measuring 5.0 to 12.9 inches d.b.h.

Pole or pile tree. -- A pine tree from which a pole or pile could be cut conforming in general to specifications as set up by the American Standards Association.

Standard cord. -- A stacked pile of round or split wood bolts measuring 4' x 4' x 8' and estimated to contain 90 cubic feet of wood and bark in pine and cypress species, and 80 cubic feet of wood and bark in hardwood species.

Round timber. -- A stand of turpentine pine trees (longleaf or slash pine) that has not been worked or chipped for gum production.

Dominant and co-dominant trees. -- Trees which dominate and overtop the general surrounding stand.

Forest Type Groups

Loblolly pine. -- Stands in which pines make up 25 percent or more of the dominant and co-dominant stems with loblolly pine predominating.

Longleaf pine. -- Stands in which pines make up 25 percent or more of the dominant and co-dominant stems with longleaf pine predominating.

Bottomland hardwoods and cypress. -- Stands of mixed hardwoods, or hardwoods and cypress usually found in the larger river bottoms, which together make up 75 percent or more of the dominant and co-dominant stems.

Upland hardwoods. -- Stands of mixed oaks and other hardwoods occurring on the drier upland sites. Together these species make up 75 percent of the dominant and co-dominant trees. This type group includes a small area of scrub oak.

Forest Conditions

Sawlog Size

Old growth, uncut. -- Areas with stands composed predominantly of trees of sawtimber size having the characteristics of the original, mature timber of the region and containing at least 1,000 board feet per acre of merchantable hardwoods, or hardwoods and pine, in hardwood types. In pine types a minimum of 600 board feet per acre is required. Less than 10 percent of the volume has been cut.

Old growth, partly-cut. -- Areas with old growth stands from which 10 percent or more of the volume has been cut, leaving a minimum of 1,000 board feet per acre in the hardwood types, or 600 board feet per acre in the pine types.

Second growth, uncut. -- Areas with stands of second growth having at least 600 board feet per acre in trees of sawlog size, and with less than 10 percent of the sawtimber trees cut.

Second growth, partly-cut. -- Areas with stands of second growth in which 10 percent or more of the sawtimber trees have been cut but with the remaining stand containing 600 board feet per acre or more.

Under Sawlog Size

Second growth. -- Areas of young second growth in which the volume of timber in trees of sawtimber size is less than 600 board feet per acre with the remainder of the stand under sawtimber size.

Reproduction. -- Areas not qualifying for any of the above conditions but which have at least 80 well established and well distributed seedlings and sprouts of commercial species per acre.

Clear-cut. -- Cut-over areas having insufficient young growth to qualify for second-growth or reproduction conditions.